Claims

We claim:

1. A method for providing a virtual reality environment, comprising:

acquiring concurrently, with a plurality of cameras, a plurality of sequences of input images of a 3D object, each camera having a different pose;

reducing the plurality of sequences of images to a differential stream of 3D operators and associated operands;

maintaining a 3D model of point samples representing the 3D object from the differential stream, in which each point sample of the 3D model has 3D coordinates and intensity information;

rendering the 3D model as a sequence of output image of the 3D object from an arbitrary point of view while acquiring and reducing the plurality of sequences of images and maintaining the 3D model in real-time.

2. The method of claim 1, in which the acquiring and reducing are performed at a first node, and the rendering and maintaining are performed at a second node, and further comprising:

transmitting the differential stream from the first node to the second node by a network.

3. The method of claim 1, in which the object is moving with respect to the plurality of cameras.

4. The method of claim 1, in which the reducing further comprises:

segmenting the object from a background portion in a scene; and

discarding the background portion.

5. The method of claim 1, in which the reducing further comprises:

selecting, at any one time, a set of active cameras from the plurality of cameras.

6. The method of claim 1, in which the differential stream of 3D operators and associated operands reflect changes in the plurality of sequences of images.

7. The method of claim 1, in which the operators include insert, delete, and update operators.

8. The method of claim 1, in which the associated operand includes a 3D position and color as attributes of the corresponding point sample.

9. The method of claim 1, in which the point samples are rendered with point splatting.

10.The method of claim 1, in which the point samples are maintained on a per camera basis.

11. The method of claim 1, in which the rendering combines the sequence of output images with a virtual scene.

12. The method of claim 1, further comprising:

estimating a local density for each point sample.

13. The method of claim 1, in which the point samples are rendered as polygons.

14. The method of claim 1, further comprising:

sending a silhouette image corresponding to a contour of the 3D object in the differential stream for each reduced image.

15. The method of claim 1, in which the differential stream is compressed.

16. The method of claim 1, in which the associated operand includes a normal of the corresponding point sample.

17. The method of claim 1, in which the associated operand includes reflectance properties of the corresponding point sample.

18. The method of claim 1, in which pixels of each image are classified as either foreground or background pixels, and in which only foreground pixels are reduced to the differential stream.

19. The method of claim 1, in which attributes are assigned to each point samples, and the attributes are altered while rendering.

20. The method of claim 19, in which the point attributes are organized in a vertex array that is transferred to a graphics memory during the rendering.